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AUTOMATIC TRUNK LID LIFT (HKL)

Model: E65 - 745i

Production Date: 11/2001 - Start of Production

Objectives:

After completing this module you should be able to:

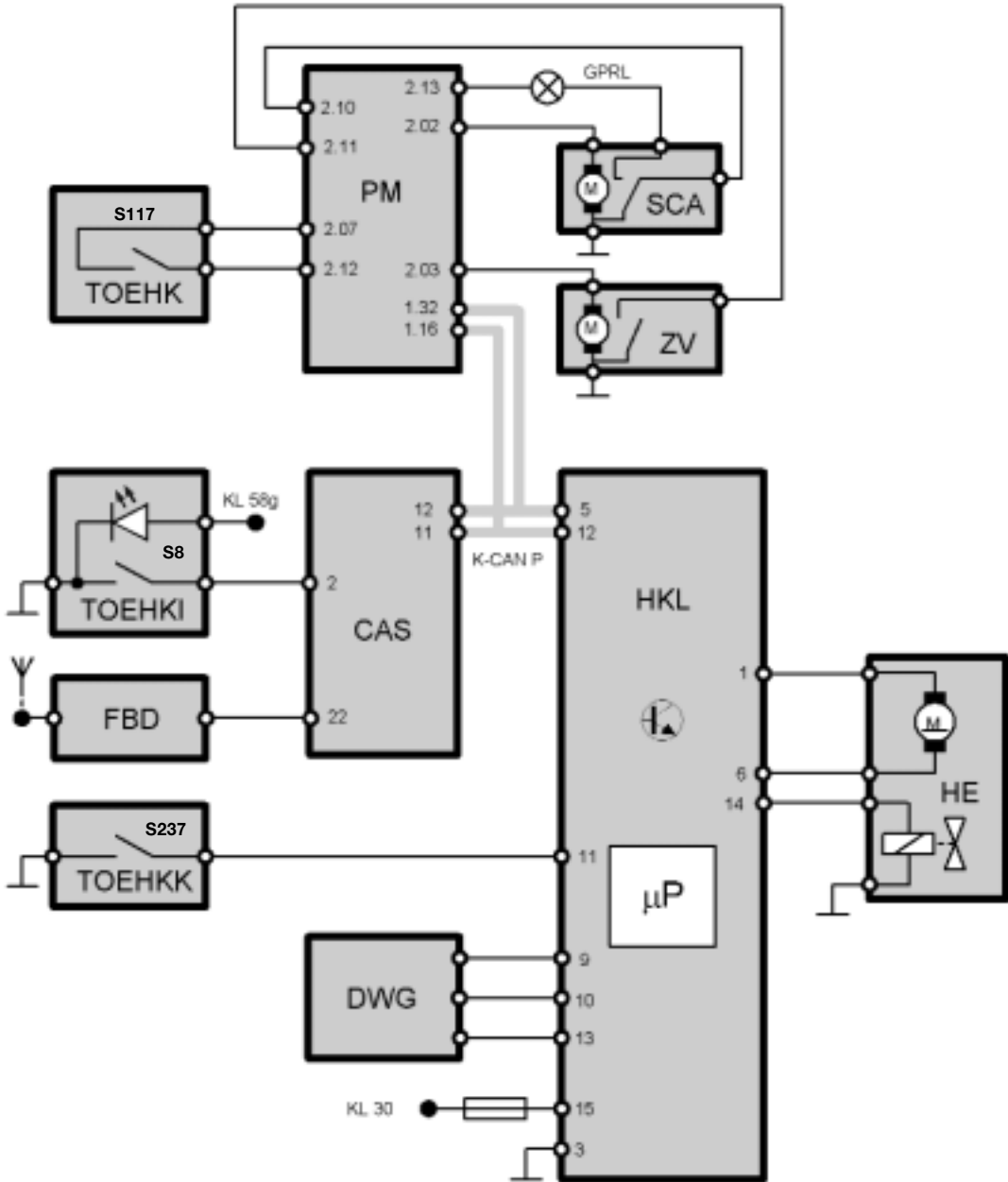
- Explain the operational sequence of events that occurs when opening or closing the automatic trunk lid lift.

Introduction

The Automatic Trunk Lid Lift (HKL) is equipped on E65s ordered with the optional convenience package. It controls automatic opening and closing of the trunk lid using a hydraulic pump and piston. The HKL control unit operates closely in conjunction with the Power Module and the CAS.

Operation of the automatic trunk lid lift is only active while the vehicle is stationary.

System Overview



Components

The HKL system consists of the following components:

- HKL control unit
- Hydraulic assembly (Pump, pressure valve, lines and piston)
- Trunk lid angle sensor
- Trunk lid button S237 TOEHKK (inside the trunk lid)

The components and principle of operation of the trunk locking system remain unchanged from a conventional trunk .

HKL Control Unit

The HKL control unit controls the automatic opening and closing of the trunk lid.

It operates in conjunction with the CAS and the PM (Power Module) and is networked in the K-CAN-P bus.

The HKL is located in the right rear corner of the luggage compartment.

The Power Module controls the operation of the trunk lid lock and the soft close assembly as well as signalling (over the K-CAN-P) the requests for opening and closing the trunk from the external trunk button.

The CAS provides the HKL with the request for opening the trunk from the Remote Control system as well as the passenger compartment trunk button.



Hydraulic Assembly

The hydraulic pump (radial piston) of the trunk lid lift is driven by an electric motor which operates in two directions of travel.

The pump is located near the mount for the right rear strut.

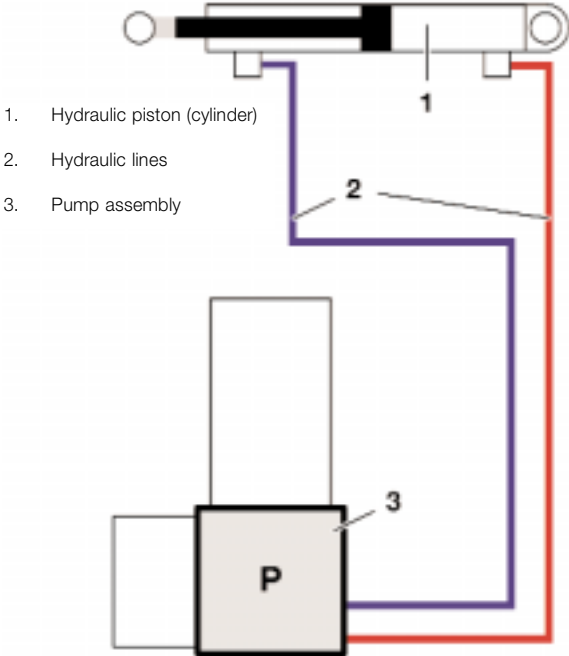
It is controlled via a PWM signal from the HKL control unit. The signal is varied depending on the opening angle of the trunk lid to maintain an even closing speed over the entire range.



An electro-mechanical hydraulic pressure valve is integrated into the hydraulic pump. The pressure valve is controlled by a PWM signal from the HKL control unit. The valve is normally open.

The hydraulic pressure increases as the valve is powered closed. The hydraulic pressure, controlled by the PWM signal affects the trunk lid opening/closing force.

The maximum pressure produced by the hydraulic assembly is 100bar.



kt-8970

The hydraulic piston is attached to the left side trunk hinge.

There is no initialization necessary when exchanging hydraulic components.

The trunk should be operated several times to displace any air that may be in the system.

Trunk Lid Angle Sensor

To detect the position, opening angle and speed of the trunk lid, an angle Hall sensor similar to those used on the E46 convertible is used. A voltage value is output depending on the opening angle of the trunk lid.

The angle sensor is attached to the right side trunk hinge.



The lid opening angle is divided into 9 segments.

These segments are used to determine the required system pressure to maintain a steady opening/closing speed.

Trunk Lid Button S237 (inside of the trunk lid)

This button can only be accessed after the trunk lid is opened. It is primarily used to signal the HKL to close the trunk, however it can signal both an open or close request.



Input to the HKL control unit from this switch is a momentary ground signal. The ground is provided by the position contact inside of the trunk lock actuator (ZV) only when the trunk is “open”

An illuminated switch indicates that there is a ground available.

Principle of Operation

Sequence of Opening Operation

When the "Open" request is sent by radio-control key or by a trunk button (TOEHK S117 or TOEHKI S8), the PM operates the trunk lid lock actuator (ZV).

The operating command is transferred by the K-CAN-P to the HKL which activates the pump in the "Open" direction. The pressure valve is still not activated, so the pressure in the hydraulic system is minimal. When the trunk lid lock is fully open, the contact inside of the ZV signals the PM.

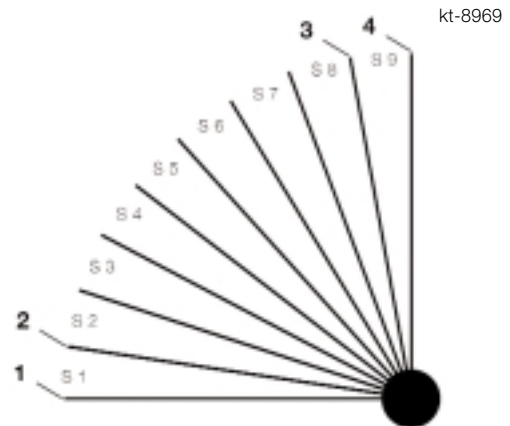
This information is also transferred by bus to the HKL. Simultaneously as the SCA motor is being operated by the PM the HKL activates the opening operation. The pressure valve is closed and pressure is built up. The lid is now opened fully.

The HKL module detects the position of the trunk lid using the angle sensor.

Shortly before reaching the end stop "lid open" (transition from segment 7 to segment 8), trunk speed is reduced and the lid slowly moves to its end position.

If one of the control buttons is pressed again during the opening sequence, the operation is interrupted. Pressing the button once more resumes the sequence.

Operation of the automatic trunk lift is not allowed if the outside temperature (K-CAN-P signal originated by the Kombi) is below -30°C (-22°F).



Sequence of Closing Operation

When the "Close" command is sent by pressing the control button (TOEHK S117 or TOEHKK S237), the HKL activates the closing operation.

The pump motor is activated in the "closing" direction by reversing polarity in the HKL control unit. Shortly before the trunk lid reaches the closed position, the speed of the lid is reduced to provide a smooth run-down into the lock assembly.

Once the contact switch in the trunk lock ZV opens, the SCA runs to bring in the trunk lid to the final closed position.

Anti-Trap

The trunk lid speed is reported to the HKL control unit by the angle sensor. The speed is compared with the time curve stored in the module. If this speed is slower than the stored value the trunk lid is stopped.

Timed Arrest

An timed arrest function prevents the pump motor from overheating:

If the pump is in continuous operation for 2 minutes it is shut-off for 6 minutes to allow it to cool.

The pump cannot be operated before the 6 minutes have elapsed.

Emergency Mode

If the automatic control malfunctions, the trunk lid can be opened and closed in the same way as a conventional, manually operated lid, i.e. without the need for additional measures.

Slightly more effort is required to open the trunk than for a gas-spring assisted lid.

After manually opening the trunk lid, it should be opened and closed twice hydraulically. This process vents the hydraulic system again.

Review Questions

1. How does the HKL control unit control the speed of the trunk lid to provide a smooth rundown at the end positions (Fully open/closed)?

2. At what outside temperature is the HKL no longer operational? Where does this signal come from?
